the Classroom Aquarium Education Program

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Welcome
to the
Classroom Aquarium Education Program!

This will be an exciting adventure for you and your students.

This program offers students many learning opportunities and very exciting moments:

- The fun of learning about fish and the habitats needed to survive
- The newness of setting up a fish tank to replicate the natural environment
- The anticipation of the day your fish eggs arrive
- The excitement the day your eggs arrive and the thrill of watching eggs hatch and grow
- Monitoring the fish on a daily basis and having students noting the changes in journals
- The bittersweet day you release the fish into the "wild".

The Department of Fish and Wildlife and our partners will provide you with as much support as possible to make this a valuable and fun learning experience for you and your class.

With more than 400 classrooms participating in this program in the Bay Area alone, a dozen fly-fishing clubs providing classroom support, and dozens of other organizations providing support, curriculum, and programs – you will not be alone in this adventure. Let us know what help you need.

As you grow your program, take time to share the results of your work with us so we can include them in our newsletters. You can always post your ideas, questions, and pictures to our FaceBook page.

Take time to explore www.classroomaquarium.org and classroomaquarium.wordpress.com for curriculum, games, lists of books, forms, procedures and new ideas.

Mostly, have fun. Teach well. Try new things.

Thanks for participating in this award-winning program.

Ethan Rotman
Trout in the Classroom Coordinator, SF Bay Area
R3CAEP@wildlife.ca.gov

San Francisco Bay Area
Classroom Aquarium Education Program

Benchmarks for Classes Hatching Trout

Event	Timing (approx)	notes
Training	November thru February, depending on where you are located.	Marin/SF – December East Bay – January Sonoma – January South Bay – Jan or Feb
Submit 772 application	Returning teachers no later than 12/15 New teachers submit at workshop	In most cases, submit 772 to your sponsor or to R3CAEP@wildlife.ca.gov
Meet with sponsor	As soon as possible	
Begin introducing students to habitat	1 month prior to egg delivery	
Clean and set up tank	3 weeks prior to egg delivery	
Receive eggs	**Rainbow trout** - target date is the first week after Presidents Day (late Feb) **Steelhead** – Feb through April (see web page for exact dates)	
Fish hatch	3 to 10 days after delivery	
Release fish	No later than 8 weeks from delivery	We recommend releasing soon after the fish "button up".
Clean Tank for storage	After release	
Return 772 & SFR form	As soon as fish are released- no later than 10 days after release	Failure to return 772 makes you ineligible to recieve eggs next year

If you have questions, contact your club sponsor or Ethan Rotman, CAEP program coordinator at (415) 999-5924 or R3CAEP@wildlife.ca.gov

Quick Resource Guide

CDFW

Program Coordinator: Ethan Rotman • (415) 999-5924 • Ethan.rotman@wildlife.ca.gov

Your Coach

Sponsor Organization: _____

Coaches name: _____

Phone: _____ Email: _____

Sponsors webpage: _____

Resources

Classroom Aquarium Education Program Webpage – www.classroomaquarium.org
curriculum, worksheets,

- Forms
- Tank set up and care information
- Program guidelines
- Videos
- Correlations to educational standards
- and more

CAEP blog – www.classroomaquarium.wordpress.com

- Articles
- Ideas
- Resources

CDFW invasive species program -
https://www.wildlife.ca.gov/Conservation/Invasives

National Trout in the Classroom Program -
http://www.tu.org/connect/groups/trout-salmon-in-the-**c**lassroom

Applications and Permits:

Preferred method of submittal
Scan and email a PDF (photos not accepted) to: R3CAEP@wildlife.ca.gov
Send a copy to your coach

Other methods of submittal:
CDFW- CAEP
7329 Silverado Trail
Napa, CA 94558
Fax: (707) 944-5563
Retain a copy for your records.
Check to see if your application/permit was received at
www.classroomaquarium.wordpress.com

Partner Responsibilities

Roles of Partners

The following parameters outline the roles partners play in development of a trout in the classroom program.

- ***California Department of Fish and Wildlife***
  - Coordinate program
  - Provide copies of manuals and brochures
  - Provide eggs
  - Authorize release sites and provide copies of permits to qualified teachers
  - Assist in locating possible funding sources for equipment
  - Advertise training and provide resource materials
  - Operate program under guidelines set out in CDFW Operations Manual
- ***Sponsor (Fly-fishing Club or Environmental organization)***
  - Assist at teacher training workshops
  - Provide in-class support to teachers (setting up aquarium, maintaining eggs and fish, troubleshooting problems)
  - Assist class with release of fry
  - Provide financial assistance to school to cover cost of equipment or provide equipment on loan
  - Pick up eggs from CDFW and deliver to schools
  - Assist teacher in completing and returning the Permit form 772.
  - Assist teacher in inuring all stipulations of the Permit 772 are followed.
  - Complete and return other required paperwork and forms provided by CDFW
- ***Teacher***
  - Attend and participate in a training to become certified
  - Apply for and follow limits of the permit form 772
  - Provide classroom space for aquarium
  - Ensure the eggs and fish are properly cared for and released according to their permit
  - Return permit as stipulated
  - Provide classroom activities related to habitat, fish and conservation to support the classroom activity of hatching the eggs
  - Complete and return other required paperwork and forms provided by CDFW

- ***Local Park or water district***
  - Complete and return other required paperwork and forms provided by CDFW
  - Co-lead (with other partners) training sessions
  - Provide naturalist to assist teachers as able
  - Provide educational resources to teachers
  - Host workshop

Partner Responsibilities (continued)

San Francisco Bay Area Partners

- Alameda Creek Alliance
- American Fisheries Society – Santa Cruz Student Chapter
- Aquarium of the Bay
- City of Belmont Parks and Recreation
- Diablo Valley Fly Fishermen
- East Bay Regional Park District
- Grizzly Peak Fly Fishers
- Golden West Women Flyfishers
- Guadalupe Park Conservancy
- Marin Municipal Water District
- Mission Peak Fly Anglers
- Napa Valley Fly Fishers
- North Bay Trout Unlimited
- International Federation of Fly Fishers – Northern Calif. Chapter
- Peninsula Fly Fishers
- Redwood Empire Trout Unlimited
- Russian River Fly Fishers
- Russian River Wild Steelhead Society
- San Gregorio Environmental Resource Council
- Santa Clara County Parks
- Sonoma County Water Agency
- The Bay Institute
- Tri-Valley Fly Fishers
- United Anglers of Casa Grande High School

About Your Sponsor and Coach

To help you, the classroom teacher, spend as much time teaching your students about fish and watersheds as possible, we do our best to provide each teacher with a coach from a sponsoring organization. This person is your support in helping you provide this outstanding opportunity for your students.

Anglers and environmental agencies care about protecting, preserving and restoring the planet we live on, so the next generations can enjoy the outdoor experiences that have made such a difference in our own lives. Your efforts are instrumental in achieving this goal.

About Your Sponsor and Coach - continued

Each sponsor may provide a slightly different level of service and each individual coach has a different set of skills and strengths. A coaches job is to provide teachers with as much support as possible to make the experience of hatching trout eggs and releasing the fry as valuable and enjoyable as possible. This includes:

- Provide direct support to teachers/classrooms
- Assist with tank set up, operation and trouble shooting
- Ensure teachers complete & submit 772 applications and permits in a timely manner
- Deliver eggs to classroom
- Be available to provide assistance as needed (phone, email, or in person)
- Attend at least one teacher training workshop
- Attend at least one coach training workshop
- Be available to interact with students at the teacher's request
- Help teachers set up their release day – some lakes require advance notice
- Assist with fry release if needed

As most coaches are not professional educators, they have different levels of comfort with students. Ask your coach for what you need and want from them. Remember they are volunteer and may not feel comfortable with all requests. Help them as much as possible as they are here to learn as well.

Coaches and their organizations all appreciate the small thank yous – smiles from students, letters, cards and simply acts of gratitude go a very long way.

Keep this information handy:

Your Sponsor: _____

Your Coach: _____

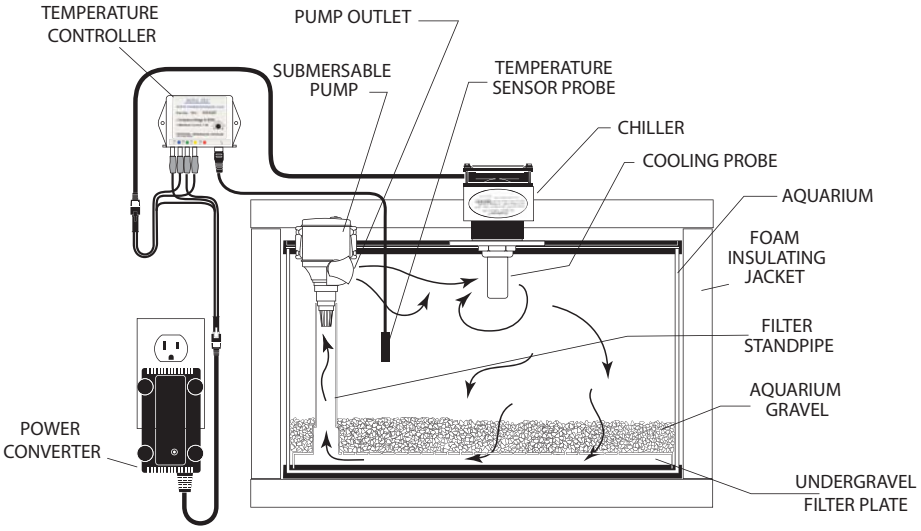
Phone: _____ Email: _____

Hints for Working With Coaches

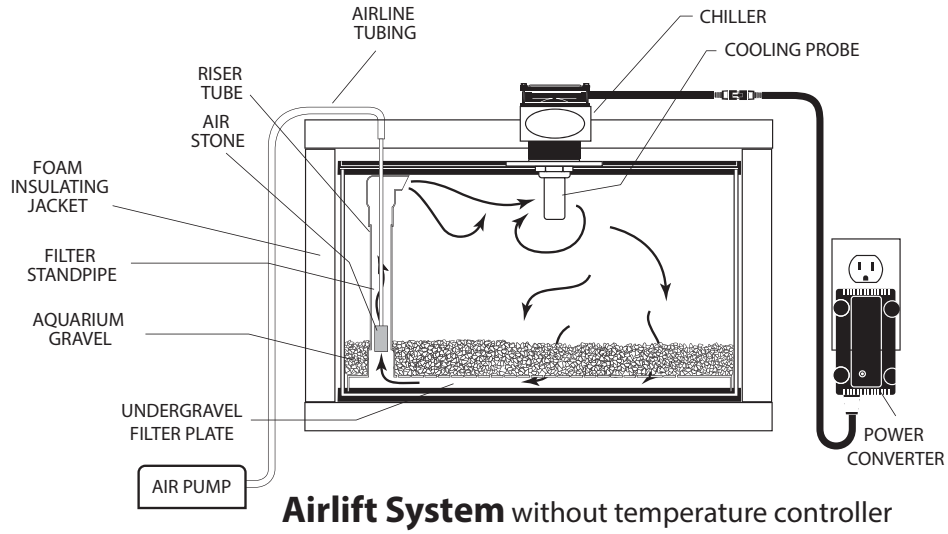
- Ask what they feel comfortable doing with your students
- Ask about them – why do they do this? What motivates them?
- Introduce the coach to the students sharing fun background information
- Be clear in what role you hope the coach will play but remember they are volunteers and can say no
- Provide the coach with a list of questions students may ask
- Be present at all times to help with classroom management
- Guide coaches in speaking at an appropriate level for your age group
- Be clear on any content or topics you hope they will address (coaches are given information on how CAEP coorelates and supports NGSS)
- Have the students thank the coach and the sponsor
- Offer to make a presenation to the sponsoring organization (this is a huge help for recruiting new coaches and is quite fun for you)
- If your coach is a flyfisherman, ask them to talk about flyfishing. Perhaps they will bring in flys or do a casting demonstration

TYPICAL AQUARIUM SYSTEMS

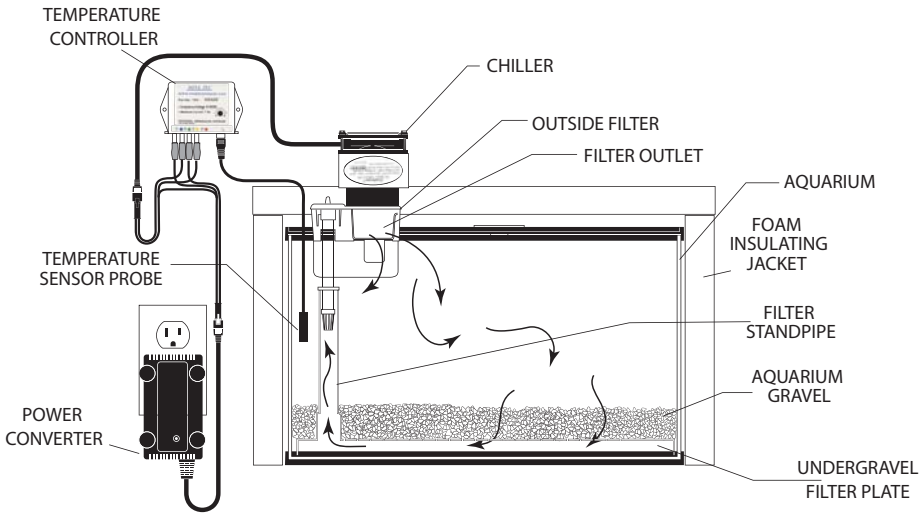
These diagrams illustrate a variety of typical aquarium systems. Your's may vary, check with your sponsor for the system that best meets your needs.



Electric Pump System with temperature controller



Airlift System without temperature controller



Outside Filter System with temperature controller
(the chiller is mounted in the outside filter)

To Feed or Not to Feed?

Many teachers struggle on the issue of whether to feed the fry or not. It feels instinctive to nurture the animals in our care by providing food. The danger is that the fish food adds contaminants to the tank as does the fecal matter generated once the fish begin eating. This makes it more difficult to keep the tank clean and increases the risk of mortality.

As the fish are only in your tank for a maximum of 8 weeks from egg delivery, they do not need to be fed – they can survive for a couple of weeks without food.

If you choose to feed fry, here are some guidelines:

1) Only use the food provided by CDFW hatcheries. Adding anything else is a violation of your permit. As these fish will be released into fishable waters, potentially they could end up on the end of line and be consumed by humans. While this may seem unlikely, we are still required to follow USDA rules on feed for animals for human consumption.
2) The tank should be given a very tiny sprinkle of food only. Less is better, more is dangerous. If any food particles fall to the gravel, the fish have been overfed.
3) Use your sterilized turkey baster to remove all debris from tank on a regular basis and change the water frequently
4) Watch for dying fish and if spotted, release the survivors as soon as possible

Some teachers opt to feed the fish for a day or two prior to release as this fulfills the desire students feel to "nurture" the fish while minimizing the risk of mortality.

We recommend NOT feeding the fish, or feeding the just prior to release. Ultimately though, it is your decision. Good luck with your fish!

Ways to Involve Your Students

Start Now

- Form the habit now of devoting a period of time weekly to Trout in the Classroom.
- Name the time "Nature Ed" or a name that the students decide on with your guidance.
- Talk with staff and other people at your school to see about collaboration opportunities between grades and subject levels.
- Send your sponsor a thank you card for their donation of time and materials.
- Conduct an interest survey of your students and their families – ask questions like: Do you eat fish, have you ever been fishing, have you ever seen a live trout, etc… and gather the results to help you understand the level of prior knowledge and interests of your students.

Introduce Your Students to What Will Be Happening in Their Classroom

- Show the video at www.classroomaquarium.org - tell students about your inspiring experience at the workshop and let them see the video with teachers, students, and fish in action.
- Show the Intro PowerPoint from the Wild About Trout CD.

Use Journals Actively in the Classroom

- Create a journal with construction paper covers and copied pages from Salmon and Trout Go To School.
- Use a composition book and attach supplementary materials with tape. eg: tape a fish origami or fish print onto a journal page.
- Incorporate fish journaling into existing writer's notebooks.
- Activities to consider:
    - Create shoebox dioramas that illustrate trout in their habitat
    - Respond to each activity with a short group discussion and written reflection.
    - Observe, draw and describe changes in fish anatomy as they develop.
    - Use observations as a prompt for poetry, exposition, personal narrative writing, etc…
    - Collect scientific data and tie to your math curriculum.

Use the Materials You Received at This Helpful Trout in the Classroom Workshop

- Wild About Trout CD (PowerPoint presentations with narratives for teachers). Use these PowerPoint presentations early and often by trying one of these teacher support ideas, student engagement ideas, or for your own education:
    - **Intro – PowerPoint**
        - Teacher – Use the information to ready yourself for the program and determine the variety of activities you will do with your students.
        - Student – Use the information to understand the process that is about to occur in your classroom
        - Things to consider – Make connections between the entire process and your curriculum. One idea is to include how the ecosystem of the tank is similar to the trout habitat in the real world.
    - **Stages – PowerPoint**
        - Teacher – Use the images to create your own neat games, like Go Fish!
        - Student – Compare the life cycle of trout to that of a human
        - Things to Consider – Some students have never seen a fish in its early stages of growth or even thought about how the parts of a fish work

together to help it breathe under water. Think about how your students may have their interests peaked in these life stages and functioning systems. eg: Do they like Venn Diagrams or making T-Chart posters?

- **Food – PowerPoint**
  - Teacher – Make connections between other subjects, like math and writing in journals. eg: Estimate how many insects might a fry eat each day. Explain why that number was chosen as an estimate. Can we really be sure of our estimate?
  - Student – What would eating these foods taste like? Do you think the trout can taste them? Do people anywhere eat insects? Why do you think the trout eat these foods?
  - Things to Consider – Don't be afraid to use conjecture in your teaching and say to the students, "I don't know, let's find out together". You can generate lists of questions and work as a team to find the answers, if possible. Not everything has an answer and it is okay to say to your students, "I'm just not sure".
- **Watershed – PowerPoint**
  - Teacher – Think about the concept of topography and how your students understand the speed and flow of water. How could you help them to understand that the steeper the hill, the faster the water travels and therefore the more sediment will move?
  - Student – What could you use to build a watershed model? What could you use to simulate rain? How would the rain you create travel through the watershed?
  - Things to Consider – This presentation does an excellent job at introducing the concept of how the urban use of concrete can and will impact a watershed: rate of flow, groundwater absorption, pollutant possibilities, mud and clay build up, and more. Perhaps there are simple models or other projects that students can build to show these impacts.
- **Habitat – PowerPoint**
  - Teacher – Nearly every grade level addresses the concept of habitats and ecosystems in one way or another. In showing the numerous species that live within a habitat and what abiotic factors make up those areas, a teacher could go in many directions with this presentation to fit his or her specific science benchmarks and standards.
  - Students – What can help encourage people to be accountable for their actions? What can one person do to help others be more accountable for their actions? When the students know the impacts of behaviors, like littering, what action can they take to educate others to know the impact of their behaviors as well?
  - Things to consider – The Pacific Ocean has a massive floating landfill known as the "Great Pacific Garbage Patch". Litter, plastics, and other debris that float down streams and rivers are contributing to the size and magnitude of this aquatic landfill, which is now larger than the state of Texas. Would your class benefit from seeing the impact of habitat destruction at both a local level as well as on a more global level, like the garbage vortex in the Pacific Ocean?

Read!

- *EggHead* by Jonathan J. Nix. Contact author, illustrate as a class project
- *Lightening's Tale* by Hugh Campbell. Read a chapter at a time to learn about trout needs.
- Check out additional book titles at www.classroomaquarium.org under: More Fun Stuff, or check the titles listed on the "Books on Trout" page in this manual.

Student Tasks and Ideas

- Get the tank ready.
- Record daily temperature and record fluctuations, if any, and journal your thoughts about them.
- Estimate the hatch date of your eggs and buttoning up of the alevin.
- Observe eggs, alevin, fry and journal the findings.
- Use the valuable resources from Trout in the Classroom workshop to help you understand the needs, habitats, and life cycles of trout.

Prepare For Release

- Write Poems and wishes for your fish.
- Ask students for ideas on the best way to safely release the fish.
- Write stories of the fish's journey after release from the perspective of the fish.
- Call your local newspaper and invite them to the release.
- Take lots of photographs of the release and share them!
- Invite families, sponsors, principals, members of your district administration, superintendents, Fish & Wildlife employees, Park supervisors, and other community members that have a vested interest in the health of the lake and watershed at the release location.
- Plan lots of fun games for all of your attendees to see how much fun you have with the Trout in the Classroom curriculum. eg: Oh Trout!, Hooks & Ladders, Protect the Redd, etc.
- Observe the environment of the release site and journal the similarities and differences between it and the tank that was in your classroom.
- Write a thank you card to your sponsor and include a photo from the release.

WHEN WILL THE EGGS HATCH?

Rainbow Trout eggs need approximately 550 Thermal Units (TU's) to hatch.
A Thermal Unit is the average temperature in degrees fahrenheit minus 32 degrees.

To find the amount of TU's the eggs received at their arrival in the classroom:

Temperature at the hatchery _____
− 32˚
equals: _____
Multiplied by the days at the hatchery: X _____
equals the amount of TU's the eggs received at arrival: _____

To find the amount of TU's left until hatching:

Approximate Thermal Units needed to hatch: 550
Minus the amount of TU's the eggs received at arrival: − _____
Thermal Units left until hatching: _____

To find out the amount of TU's the eggs receive each day:

Average temperature in the aquarium: _____
− 32˚
Equals the amount of TU's the eggs receive each day: _____

To estimate hatch time:

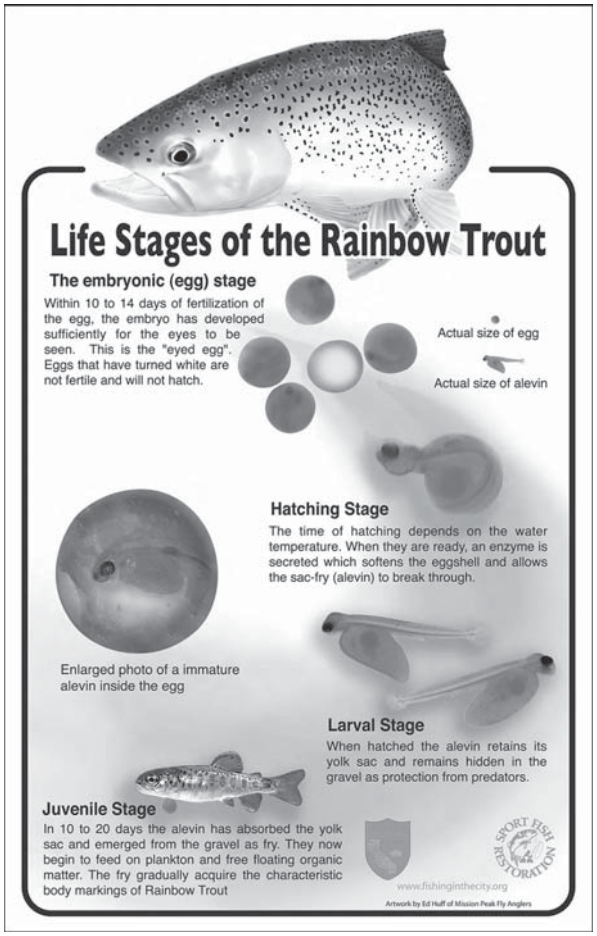
Thermal Units (TU's) left until hatching: _____
Divided by the amount of TU's the eggs receive each day: ÷ _____
The result is the number of days left until the eggs hatch: _____

Poster Themes

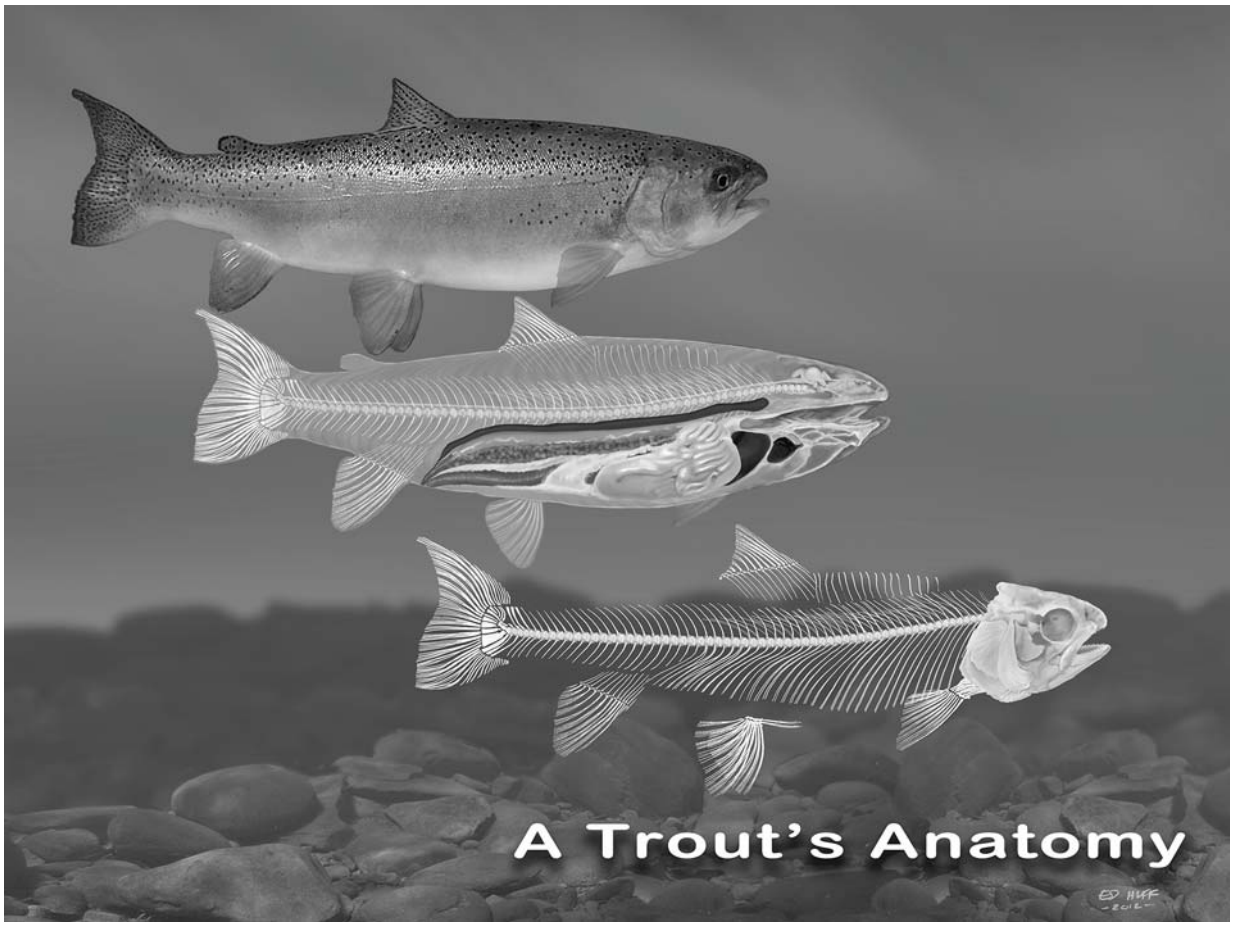
There are currently four posters available to assist you in discussing trout, their lives and their environment. Each poster has a particular theme: Life Cycle, Anatomy, Diet and Habitat.
All of the posters are available as printed posters or can be downloaded from the web. Three of the posters, Anatomy, Diet and Habitat are 18" x 24" and printed on both sides. The front illustrates the theme and the back provides information to help you begin a dialogue relating to the theme. The Life Cycle poster is 11" x 17" and is printed on one side.

These posters also correlate directly with the PowerPoint programs in the CD "Wild About Trout"

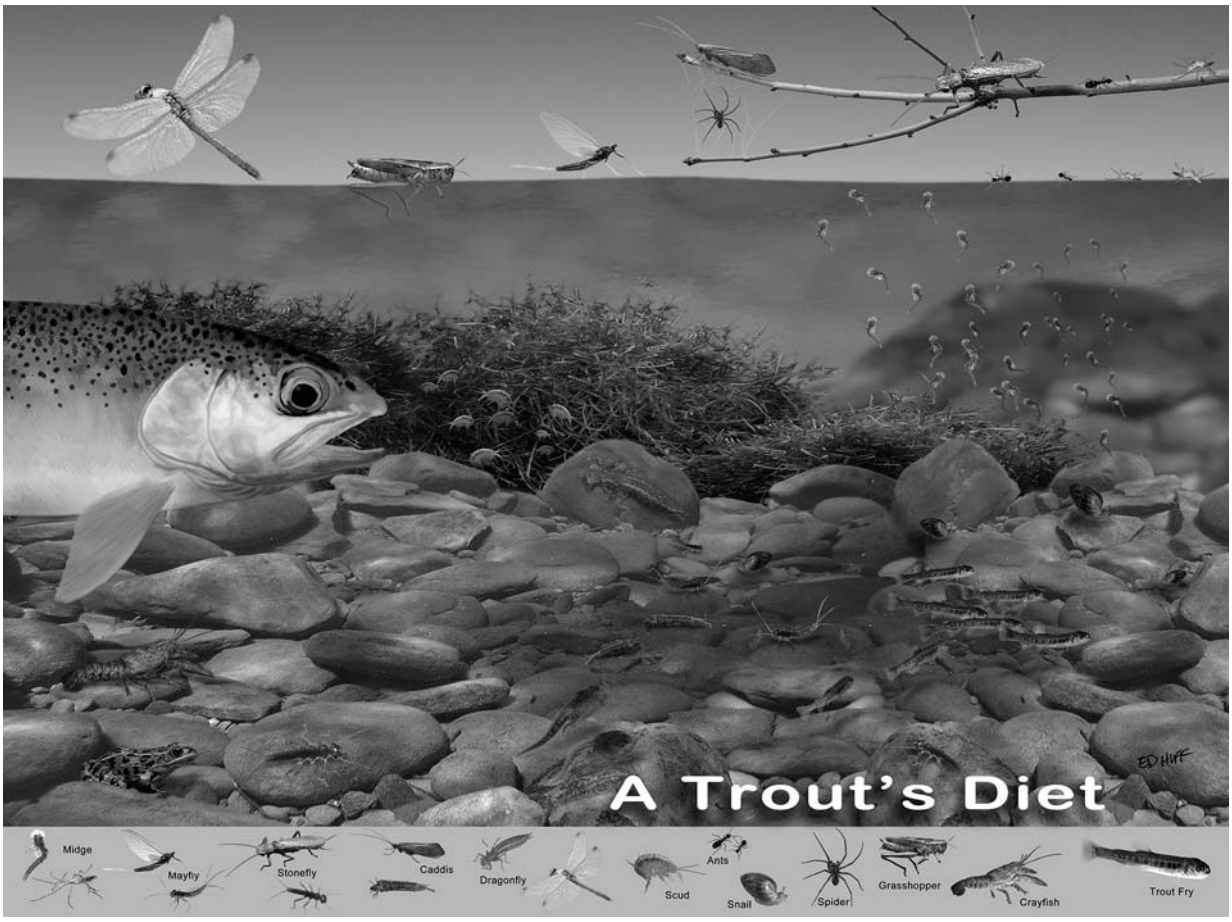
To download the posters go to www.classroomaquarium.org and select Curriculum Aids.



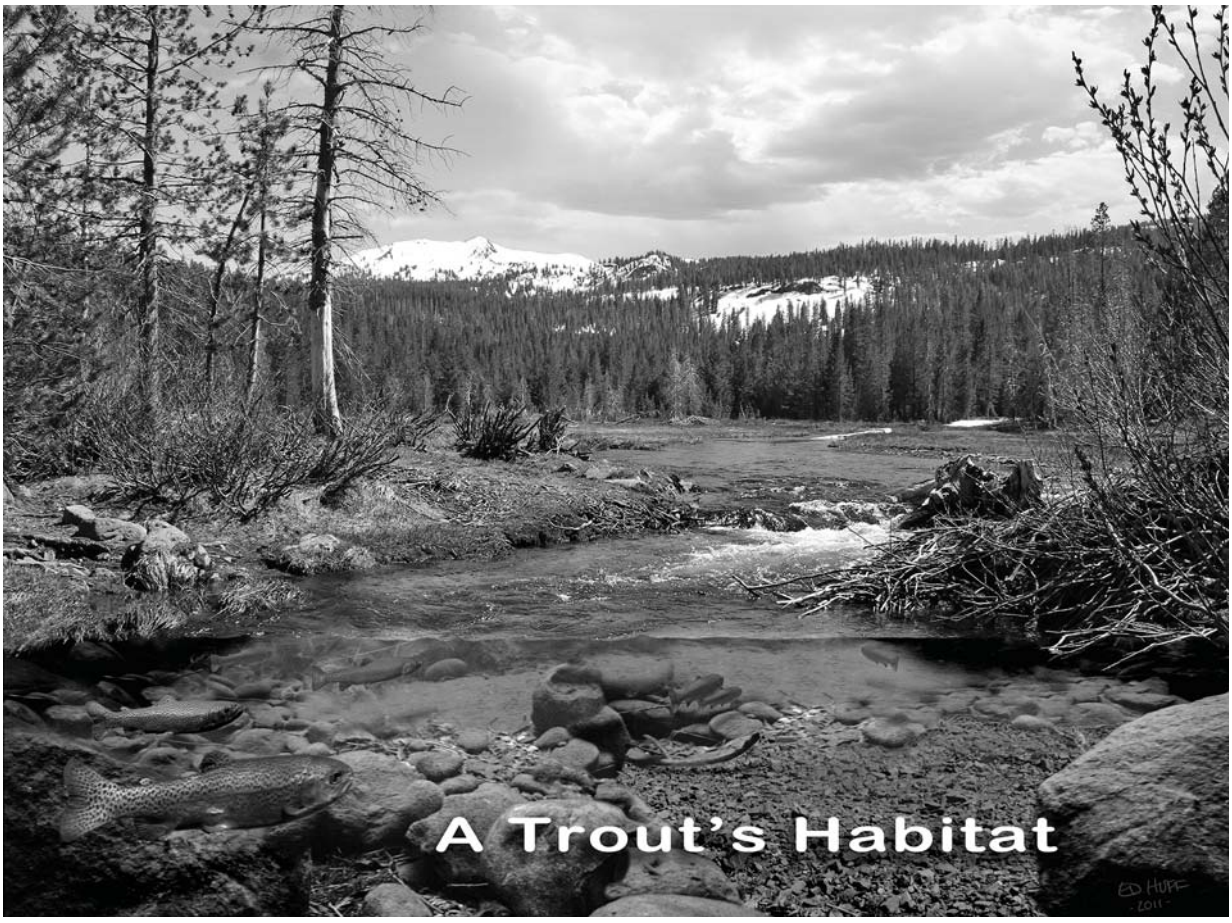
The Life Stages Poster



The Trout Anatomy Poster



The Trout Diet Poster



The Trout Habitat Poster

Books on Trout - *A student Reading List*

This list is a compilation of available books regarding trout that may be useful in the classroom or for educators. This reference is provided as a service to parents and educators, and is in no way meant to endorse any authors or books contained herein.

Picture Books and Easy Chapter Books

Campbell, Hugh. Lightning's Tale: The Story of a Wild Trout. Portland, Oregon: Frank Amato Publications, 1994.

Ciardi, John. *The Hopeful Trout and Other Limericks.* Illustrated by Susan Meddaugh. Boston: Houghton Mifflin Company, 1989.

Clark, Joan. *Thomasina and the Trout Tree.* Illustrated by Ingeborg Hiscox. Plattsburgh, New York: Tundra Books, 1971.

Cole, Harold. *A Few Thoughts on Trout.* Illustrated by Betty Christensen. New York: Julian Messner, 1986.

Cole, Joanna. *The Magic School Bus at the Waterworks.* Illustrated by Bruce Degen. New York: Scholastic, Inc., 1986.

Hertz, Ole. *Tobias Catches Trout.* Translation by Tobi Tobias. Minneapolis, Minnesota: Carolrhoda Books, Inc., 1984.

Lucas, K. H. *Fly-Fishing with Trout-tail: A Child's Journey.* Trout-Tail LLC, 2002.

Moisa, Ralph, Jr. *Little Fish.* Logan, Iowa: Perfection Learning Corporation, 1997.

Norman, Howard. *Who-Paddled-Backward-With-Trout.* Art by Ed Young. Boston: Joy Street Books, 1987.

Sayre, April Pulley. *Trout, Trout, Trout! (A Fish Chant).* Illustrated by Trip Park . New York: Scholastic Inc., 2004.

Sloat, Teri. *There Was an Old Lady Who Swallowed a Trout!* Illustrated by Reynold Ruffins. New York: Henry Hold and Company, 1998.

Turnage, Sheila. *Trout the Magnificent.* Illustrated by Janet Stevens. San Diego: Harcourt Brace Jovanovich, Publishers: 1984.

Chapter Books and Young Adult Fiction

Conly, Jane Leslie. *Trout Summer.* New York: Scholastic, Inc., 1995.

George, Jean Craighead. *The Case of the Missing Cutthroats.* Originally published as Hook a Fish, Catch a Mountain, 1975. New York: Harper Trophy, 1999.

Hyde, Dayton O. *The Major, the Poacher, and the Wonderful One-Trout River*.Honesdale, Pennsylvania: Boyds Mills Press, 1985.

Weddle, Linda Massey. *T.J. and the Big Trout River Vandals*. Schaumburg, Illinois: Regular Baptist Press, 1991.

Nonfiction and Reference Books for Children

Burk, Sandy. *Let the River Run Silver Again!* Blacksburg, Virginia: The McDonald and Woodward Publishing Company, 2005.

Burg, Ann E. *E is for Empire: A New York State Alphabet*. Illustrated by Maureen K.Brookfield. Chelsea, Michigan: Sleeping Bear Press, 2003.

Cole, Joanna. *A Fish Hatches.* New York: HaperCollins, 1978.

Pyers, Greg. *Why Am I a Fish?* Chicago, Illinois: Raintree, 2006.

Winner, Cherie. *Trout.* Minneapolis, Minnesota: Carolrhoda Books, Inc., 1998.

Reference Books

Behnke, Robert J. Trout and Salmon of North America. Illustrated by Joseph R. Tomelleri. New York: The Free Press, 2002.

Caduto, Michael J. *Pond and Brook: A Guide to Nature in Freshwater Environments*. Hanover, New Hampshire: University Press of New England , 1985.

Martin, Patricia A. Fink. *Rivers and Streams*. New York: Franklin Watts, 1999.

Prosek, James. *Go Fish: A Fishing Journal.* New York: Stewart, Tabori & Chang, 2000.

- *Trout: An Illustrated History*. New York: Alfred A. Knopf, 1997.
- *Trout of the World*. New York: Stewart, Tabori & Chang, 2003.

Stolz, Judith and Judith Schell, eds. *Trout.* Part of The Wildlife Series. Stackpole Books, 1991.

Nonfiction for Adults

Carrol, David M. *Trout Reflections: A Natural History of the Trout and Its World*. New York: St. Martin 's Press, 1993.

Louv, Richard. *Last Child in the Woods: Saving Our Children from Nature-Deficit Disorder*. Chapel Hill , North Carolina : Algonquin Books of Chapel Hill , 2005.

Prosek, James. *Early Love and Brook Trout*. New York: The Lyons Press, 2000.

This list was compiled by Trout Unlimited.

When Fish Die

This is about what to do *when* fish die, not *if* fish die. Everything that lives dies, some way before others. This is true for some of the fish in your aquarium, no matter how well you care for them or how concerned you are about their welfare.

About 60% of eggs put into classroom aquariums in the San Francisco Bay area live at least long enough to be released as fry. While very few, if any, teachers are able to nurture 100% of their eggs to release, only a handful of tanks (about 3%) experience total die off. The odds are well in your favor of having fry to release and the expectation that you will enjoy 100% survival rate may be misguided.

The survival rate of eggs in classroom aquariums is much higher than that in nature. Animals in the wild are usually eaten before they are two weeks old. This is because predators can't shop at Safeway for their food. It is also because germs have to make a living. Keep in mind a trout has between 5 and 7,000 eggs and on average, only two of those survive to adulthood.

Around 2013, CDFW switched from fertile to sterile rainbow trout eggs. (this change was made statewide to help wild fish survive). As this is a new process for our hatcheries, we have seen an elevated mortality rate in our aquariums, but most teachers are still able to raise most of their eggs to the fry stage. We are continually upgrading the processes to ensure you have the best eggs possible with the highest rate or survival.

While the death of some of your fish may be unwelcome, it presents an excellent opportunity for learning. Students can learn that everything dies, and many of the deaths can't be prevented. When fish or eggs die, students can make guesses why. This type of activity is promoted by the new NGSS standards. See suggestions about relevant activities in the teacher's manual.

Here are some tips on how to improve the survival rates in your tank:

- Clean and dry the tank and equipment thoroughly and dried each year after use. The cleaning protocol is in the teacher's manual and on the website. Don't skip any steps and do not increase the amount of bleach used.
- Check water temperature daily to ensure that it is within the acceptable range (45-55 degrees F)
- Keep all foreign objects out of the tank.
- Use only spring water (or de-chlorinated tap water) to replace water that evaporates.
- Remove any eggs or fish that die ASAP, so bacteria don't have time to multiply
- Keep bottles of frozen water at school to place in the tank if the tem erature rises into the danger zone, while your coach is arriving to help you and students detect and solve the issue

Hatching fish in your classroom provides many excellent learning opportunities for students. Death of some fish is to be expected. How you manage that with your students will make all the difference

Learning from failure:

The only failure is failing to learn from failure

What to do if some or all of your trout die.

Introduction:

The students are aware that some or all of the fish have died off, but the question remains – why did this happen? This lesson is designed to help a teacher address these concerns for the students as well as to review how to minimize the chance that it will occur again.

Suggested Materials:

- Hand lenses or magnifying glasses
- Microscopes
- Blank microscope slides
- pH Testing kit
- Gloves
- Construction paper
- Scissors
- Glue Sticks

Steps:

1. After encouraging students to share how they feel about the die off, have students in small groups examine the tank visually (have them use hand lenses, if available) and record their observations.

2. While other student groups are waiting to observe the tank, have them brainstorm their questions and record them into a group list. Students should work within their groups to try to answer their own questions, even if they aren't sure their answers are correct.

3. Once all groups have had observation time and their group question lists are compiled the teacher will facilitate a discussion to arrange all the information on the board or posters around the room. In this activity all thoughts should be recorded and everyone's input should be made as a valuable contribution. This ensures all students feel that they have an investment in the process for determining what may have gone wrong in the die off.

a. Section 1: OBSERVATIONS – Some ideas to spark discussions: Was the tank water cloudy? Was the tank full of debris? Does the tank have an odor? Did the teacher perform a pH assessment? If so, what were the results? What was/is the temperature of the tank? This is an opportunity for students to perform a little CSI on the tank and see what they can brainstorm for what went wrong.

b. Section 2: QUESTIONS – Some ideas to spark discussions: Were there too many fish in the tank? Did someone put something in the tank that didn't belong there? Is it possible the fish were sick when they arrived? Did the tank get too warm or too cold? Did we follow the proper cleaning procedures before tank set up? This is an opportunity for the students to use their observations to ASK the questions they don't understand.

4. After the sections are recorded, students should begin a discussion in their groups to try to answer some of the questions. These answers should first be recorded in small groups then shared out to the class for a whole group discussion. Record the class discussion on the board as Section 3.

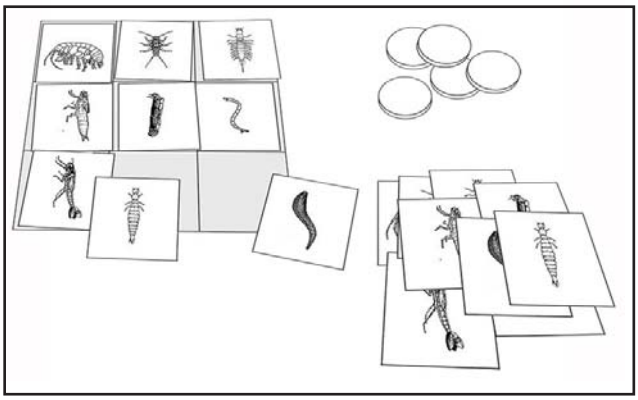
a. Section 3: ANSWERS (IF POSSIBLE) – this is an opportunity for the students to express what they THINK went wrong – these could be possible solutions to the above question section, or it could be random thoughts.

5. Once this discussion is completed, it is time for the teacher to add his/her insight. IT IS OKAY TO SAY YOU DON'T KNOW WHAT WENT WRONG! A teacher may know something, like the power went out and the chiller unit stopped working, or a detail, like the pH of the water was too high or too low, that could help students to determine what went wrong. This information should be added to the recorded sections on the board.
6. Students should be able to give any final thoughts toward the discussion before the final steps of the lesson.
7. Have students create a plan to avoid future die-off's given the above discussions. These may be actual plans that could solve the problem, or they could be imaginary solutions that aren't even possible. The idea here is to have the students feel like they can create a solution that may work in the future. This could be individual, small group, or whole class solutions, however, it is important that students state what their solution is and how they think that will address a specific problem.
8. Create a model, flow chart, or graph to further explain the student solution (if age appropriate to do so).
9. If models are created, a teacher could have the students share out their models as an oral presentation/speaking opportunity as well.
10. Allow responsible students to conduct a thorough cleaning of the tank, gravel, and all equipment per your sponsors instructions.

Active Learning Experiences

Doing engaging activities and simulations is an effective way to help students understand and accept the fact that animals die both in aquariums and in nature. The board games **Return to the Redd** and **Race to the Redd** (available on our website: classroomaquarium.org) illustrate some of the challenges fish face during their lifetimes. An exciting physical activity in which students experience the same challenges is **Hooks and Ladders**.

Bug Larva Bingo:



The point: to help students learn the names of and be able to identify aquatic invertebrates.

Each student gets a sheet of paper that looks like a tic-tac-toe game. Students choose nine small photos of different aquatic macro-invertebrate and put one in each of the nine squares (from a large collection of possible photos, including at least 12 larva). Once each student has filled all of their squares with a photo, the teacher starts holding up large photos of the same macro-invertebrates and saying their name. If students have that photo on their board, they put a token on top of it. Once they get three in a row they have a bingo.

A Hard Rain's Gonna Fall:

The point: Since trout are visual eaters, the silt stirred up by large storms interferes with their ability to find food and clogs up spawning beds.

The teacher takes 2 mason jars and fills them 1/3 with large marble-size river rocks, or even just uses large marbles. Silt is added to fill in the gaps between the marbles. This should be done the day

before or early in the morning to allow all the silt to settle for the demonstration. The teacher then tips one of the mason jars 45° and pours water slowly down the side to simulate a slow rain storm. Students can then observe how much silt gets kicked up into the water. Following this, the teacher pours water rapidly into the upright second mason jar to simulate a downpour. Students can then observe how much more silt moves into the water during a large storm.

Slow rain storm

Downpour

Bug Science:

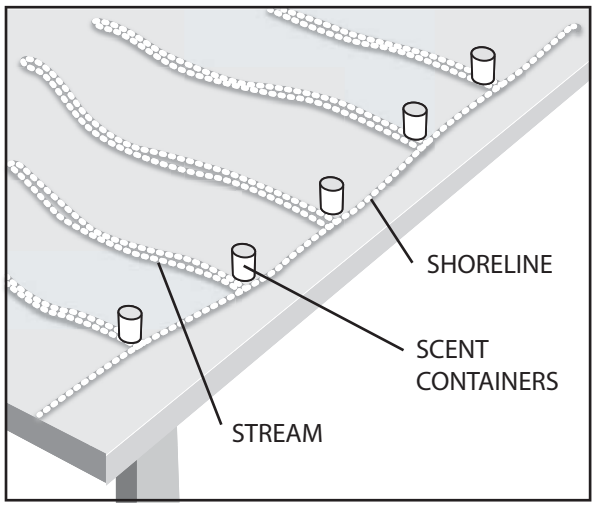
The point: By seeing what bugs live in streams, students can discover how clean the water is, as some macro-invertebrates are more sensitive to pollution than others.

The class is divided into groups of student scientists and each group gets a Ziploc bag with photos of bugs that have been collected in a stream. Using the Izaak Walton League chart, or something similar, students then match the bugs in their Ziploc to one of the categories of streams. Each group reports back on what kind of stream water quality they have discovered, based on the bugs. (The bug cards students put on their bingo game could be used for this activity as well, but the teachers have to sort them properly beforehand or many of the results will be inconclusive.)

Find Your Home Stream:

The point: when it is their time to mate, steelhead trout and salmon must find their way back to the spawning grounds of their birth. They use their sense of smell to help locate their home stream.

On a large table or row of tables or playground, lay out the shoreline of the ocean using ribbon, heavy cord, crepe paper strips, etc. Next, using the same materials, lay out series of streambeds starting at the shoreline (see illustration). Clear tape will help hold streams in position. Obtain small pieces of clean sponge or cotton balls. Saturate each with a strong scent such as peppermint, banana, cinnamon, deodorants, etc. and place in separate small containers. Old but clean medicine vials, baby food jars, even baggies will work. The number of "streams" you create will depend upon the number of different scents available. Mark each "stream container" with the name of an actual river/stream (i.e. Klamath, Eel, Smith, etc.) and make a record of which scent goes with which "river". Mark the bottom of the remaining containers with a letter or number code to identify the scent of the trout's birth stream and to keep the scents separate during handling. It is expected that you will have many duplicate scents, which correspond to numerous fish having the same stream of origin. Using a random draw, each student gets one container. Playing the part of the fish, each student will sniff the various "stream containers" until they identify similarities to their own scent bottle and follow their birth stream to it's spawning redd at the end, where they will place their bottle. If they have created a small trout drawing with their name on it, they can use those pictures to mark their birth stream. Using the previously prepared code sheet you can check to see how accurate the students were in selecting their birth stream. Students as well as steelhead and salmon sometimes make mistakes in utilizing scents and these "mistakes" allow for bio-diversity... so mistakes are okay.



Hooks and Ladders

We play a game at workshops called Hooks and Ladders that captures many of the challenges in the life of a trout. It illustrates the difficulty of surviving long enough to return to their birth stream. Play the game one step at a time so students can see how many trout die and how many are eaten. After the deaths are recorded all students rejoin the game for the next step. A full description of this game is in the Project WILD Aquatic Guide, but use this one:

1. Lay out a curvy, stream-like course with ropes or safety cones for the baby trout to swim down to the lake or ocean. It should be wide enough for trout to barely be able to make it past the predators in second round.

2. *First round:* Have two students spin a jump rope that spans the creek, over which trout must jump. It represents the intake of a water diversion system. Trout that get hit by the rope must stand to the side while all the others try to pass safely. Tally and note the results for later discussion and/or graphing in the classroom.

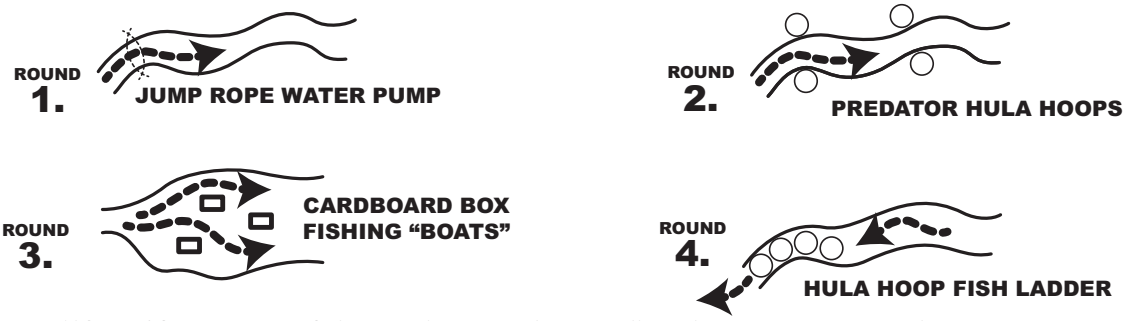
3. *Second round:* Place Frisbees or hula hoops along the creek on both banks for predators to stand on/in. Predators, which can be a combination of great blue heron, bear, mergansers, or raccoons, try to tag the trout as they swim by. When they do, they must place their catch behind them, outside the stream, before they can tag another. This leaves a few seconds for other trout to move past them. Predators may not step outside the hula hoop (take their foot off the Frisbee) or over the creek bank.
When the surviving trout reach the end of the stream, tally and make note of how many made it and how many died. This can be discussed and/or graphed when back in the classroom.

4. *Third round:* Trout must now swim across a larger field, representing a lake or ocean with fishermen. Fishermen/women with one foot in a cardboard box (their boat) try to tag trout as they swim by (walking fast, no running). Trout that are tagged step to the side of the field. Tally these results too.

5. *Fourth round:* Return to the stream for the final round in which fully grown trout swim back upstream to their birth site. Place hula hoops within the narrow far end of the creek, representing a fish ladder around a dam. Trout must hop from one hoop to the next. Ones that step on a hoop die from exhaustion and must step to the side. Tally these numbers too.

6. Ask for a show of hands of how many trout died at any stage of the process. Ask students whether they think this accurately reflects what occurs in nature, and ask them to explain. After returning to the classroom, graph or discuss the numbers and make the point that many trout die, even in a natural setting. But as long as a few trout make it back to the spawning beds, they will lay thousands of eggs that can re-establish the population.

Suggested Layouts for Streambeds



NOTE: After counting fish mortality at each step, all students participate in the next step. This keeps all students actively engaged in the entire game.

PLANNING YOUR RELEASE DAY FIELD TRIP

Releasing your fry into the "wild" is an important part of the process and will be memorable for students. It may be tricky to plan as the fish may develop faster or slower than you anticipate. The fish must have absorbed their entire yolk sac to be ready for release and under no circumstances can you release them more than 8 weeks from the date of egg delivery.

A general rule of thumb (or fins) is to release the fry 4-6 weeks after delivery. There are a many options for a successful fry release field trip, and they can be easily adapted to suit your class and school needs.

STATIONS: A great option for larger groups is to have several activity stations and have small groups of students rotate from station to station. This usually requires one person (teacher, parent or volunteer) to lead each station. If you don't release the fry as a class, the release can be included as a station, with each group releasing a few fish. Other ideas for stations can be found on the SIC CD, in Project Wild Aquatic, or in the Fry Release Field Trip Guide.

GROUP ACTIVITIES/GAMES: If you prefer to keep the class together, there are also plenty of options. Many games & activities can easily accommodate larger groups, and releasing the fry as a group can be very exciting! If you plan on keeping the group together, make sure to plan activities in advance, have materials ready, and make sure to keep things moving.

SOME THINGS TO KEEP IN MIND WHEN ORGANIZING YOUR TRIP

- **Plan your field trip for about 1 week after the fish button up.** You can calculate this based on the water temperature at the hatchery and in your aquarium.
- **Check to see if the release site requires advance notice of your arrival.** Some park districts will waive fees for your release, others require advance registration, while some are just fine with you showing up on your own schedule.
- **When you schedule the bus make sure they allow live fish on board!** If the fish are not allowed on the bus you will have to make arrangements for someone to transport the fish separately.
- **Notify your sponsor organization immediately of your field trip date & location,** and ask if they are available to assist with your field trip.
- **Plan your activities,** organize a timeline, and have a plan if you get behind schedule (i.e. shorten activity times or skip last activity). Be sure to have materials and supplies gathered ahead of time and ready to go – the release day can get hectic quickly if you are not prepared.
- **Visit your field trip site in advance to check the water temperature and the facilities available.** Every site is different. Check for parking space, turn-around space for a bus, drinking water, restrooms and trash pick-up services so you can plan accordingly.
- **Arrange for teacher's aids, parents, your principal, etc. to assist you!** Plan on one adult for every 10 students in addition to the people leading learning stations. More adults for younger students is always better. If you plan a fishing or casting activity, arrange for one adult per 4 students if possible.
- **Give assisting chaperones a job.** Making sure that they know they have a role in the field trip will prevent them from standing around and chatting. One idea is to have the extra volunteers maintain a perimeter so students do not disrupt the native habitat.
- **Remind students ahead of time to dress appropriately.** Long pants, closed-toe walking shoes, and clothes that they aren't afraid to get dirty are good for field trips. Bring extra sunscreen along if it's sunny, and a large box of trash bags to use as ponchos if there's a chance of rain.
- **Don't forget the camera!** Recruit someone to be the field trip photographer/videographer.
- **Invite People!** Gain publicity and notoriety for your hard work by inviting your superintendent, city council members, news reporters / members of the media, etc… Many of the people in these positions like the opportunity to see what is happening in their school communities and the fish release is a great time to do that.

REMEMBER: Prior preparation is a necessary component of a successful fry release trip! To make the day run smoothly, be sure to plan activities, assign leads & assistants, and determine how much time you will allow for each portion of your field trip.

Applying for a 772 Permit

The permit to transport and rear fish (Form 772) is an integral part of the program and is a legally binding document. Please review the conditions of the permit.
Teachers must file and application each year. The permit will be issued to you when you receive the eggs and must be completed and returned to CDFW after releasing your fish (or after the last fish dies).
The permit is to remain with the eggs/fish at all times and must be posted on or near your aquarium. The permit must accompany the eggs/fish during transport.

To be eligible to apply for a permit, you must:

1) Have successfully completed a qualifying workshop within the past 3 years.

or

2) Received a permit within the past 3 years and complied with all terms of your permit.

To apply for a permit:

1) Download the most recent form from www.classroomaquarium.org
2) Complete the form. You can find a list of acceptable release sites for your area at www.classroomaquarium.org and in this packet
3) Return the application to your sponsor or to CDFW by December 15th or at your training workshop (whichever is later). We recommend scanning the application and submitting it as a PDF to your sponsor and R3CAEP@wildlife.ca.gov. We cannot accept photographs of your application, only PDFs will be accepted.

After releasing your fish or after you last fish dies, complete the bottom section of the permit and return it to your sponsor or to CDFW within 3 days. Failure to do this will make you ineligible to receive a permit the following year.

You are expected to comply with ALL aspects of your permit. No changes can be made without the express WRITTEN approval of CDFW - R3CAEP@wildlife.ca.gov

Hints for submitting your application for eggs and returning your permits

Of the 400 applications and permits we process each year, most go through without a problem. A few have issues and require additional time. If not dealt with, it is possible for a teacher to lose their eligibility to participate in the program.

Submitting your paperwork is not enough – it is the TEACHERS responsibility to check to make sure CDFW received the document.

Most common problems:

- Applications not complete or missing the principals signature
- Applications sent by mail or fax are not received by CDFW

Hints to help get your application and permit approved:

1. Fill out the form completely (including having your principal sign the application)
2. Scan the document and submit from your email address (do not send it from the scanner as CDFW security protocols do not allow us to open attachments from unrecognized addresses)
3. Send a copy to your coach and keep a copy for your records
4. Check the status of your submission at www.classroomaquairum.wordpress.com

Submit completed forms by email – R3CAEP@wildlife.ca.gov

Mail and fax submissions are discouraged but accepted:

2825 Cordelia Road, Suite 100
Fairfield, CA 94534

NOTE: Most "lost" or "not received" forms come from mailing or faxing. Be sure to check the status of your submission at www.classroomaquarium.wordpress.com

We DO ACCEPT:

- PDFs of applications and permits completely filled out
- Faxes or hard copies of applications/permits completely fill out

We DO NOT ACCEPT:

- Photos of applications of permits

Deadlines:

Applications (request for eggs)
Returning teachers: Applications for eggs are due by December 15
New teachers: At your training workshop (arrive with a blank application signed by your principal)
Permits
Within 10 days of release of your fry

Classroom Aquarium Education Program

Approved Release sites for rainbow trout, steelhead trout from Warm Springs Hatchery, and steelhead from the San Lorenzo River System

This list is current as of 8/2017 and is subject to change.
Please check www.classroomaquarium.org for updates.

Releasing Rainbow Trout

With appropriate authorization, rainbow trout fry may be released into:	***Trout may NOT be released into:***

• Alameda County
  • Lake Elizabeth
  • Lake Temescal
  • Lakeshore Park
  • Quarry Lakes
  • Shadow Cliffs Reservoir
• Contra Costa County
  • Contra Loma Reservoir
  • Lafayette Reservoir
  • Heather Farms Pond
  • Hidden Valley Lakes
  • Lake Refugio
  • San Pablo Reservoir
• Lake County
  • Putah Creek above Lake Berryessa
  • Indian Valley Reservoir
  • Pillsbury Lake
  • Upper Blue Lake
• Marin County
  • Bon Tempe Reservoir
  • Scottsdale Pond
• Napa County
  • Lake Hennessey
• San Francisco County
  • Lake Merced (all)
• Sonoma County
  • Lake Ralphine
• Solano County
  • Lake Chabot
• Santa Clara County
  • Sandy Wool Lake
  • Spring Valley Pond
• Santa Cruz County
  • Pinto Lakeo
  • Loch Lomond
	• Campbell Perc Ponds (Temporary closure)
	• Clear Lake
	• Cottonwood Lake
	• Lake Chabot (Alameda County)
	• Lake Cunningham (Temporary closure)
	• Del Valle Reservoir
	• Don Castro Reservoir
	• Hilltop Lake
	• Kelsey Creek
	• Lake Anza
	• Lake Merritt and channel
	•Sprig Lake
	• Stafford Lake
	• Stevens Creek Reservoir
	• Vasona Lake
	• **Any body of water not specified on your Form 772 (PDF Form)**

Release of Steelhead Trout from Warm Springs Hatchery

With appropriate authorization, steelhead trout fry obtained from Warm Springs Hatchery may be released into the Russian River or the approved tributaries listed below:

Mendocino County	Sonoma County	Other Approved Waters
Gibson Creek	Atascadero Creek	Hobson Creek
Feliz Creek	Big Sulphur Creek	Felta Creek
Orr Creek	Brush Creek	Porter Creek
Russian River	Copeland Creek	Green Valley Creek
Dooley Creek	Dry Creek*	Smith Creek
	Dutch Bill Creek	Willow Creek
	Fife Creek	
	Foss Creek	
	Mark West Creek*	
	Matanzas Creek*	
	Mill Creek	
	Oakmont Creek	
	Porter Creek	
	Santa Rosa Creek*	
	Sausal Creek	
	Sweetwater Creek	
	*Most commonly used release sites	

TEACHERS: You may use the following language on your 772 application under proposed release site:
"Russian River or approved tributary as listed on the CDFW website"

Fish may only be released in accordance with all the terms and conditions of your approved form 772.
If you have questions, please contact Ethan Rotman at (415) 999-5924 or ethan.rotman@wildlife.ca.gov

What To Do With Classroom Animals At The End Of The School Year

Animals in the classroom can be a great teaching tool - but when the year is over, many teachers are faced with the question of what to do with these critters.

Intentional release of animals can be environmentally disruptive:

- Non-native invasive species may compete aggressively with California natives for survival.
- Even though an animal may be native or endemic to your area, it may harm the existing gene pool if released.
- Individuals from one area may harbor diseases or pests to which local populations (or other local species) are vulnerable.

Do not release classroom animals into nature. While this may seem humane at the time, most animals released into the wild become dinner for something larger in a very short amount of time. You will also be in violation of the law.

Here are some suggestions on what to do with your classroom animals:

- Send the animal home with a student to babysit for the summer
- Call local pet stores to see if they will take the animal
- Call your local animal shelter or humane society
- Keep the animal at your home for the summer, ready for a new batch of students in the fall

It is important that you follow your local, state and federal guidelines and regulations for handling and caring for live organisms in your classroom - and for dealing with them after your use. Make sure it is legal to acquire any animal you intend to display in your classroom. Teachers involved in the Classroom Aquarium Education Program are able to hatch and release salmon or trout under permit from the Department of Fish and Wildlife.

Here are some additional resources that may be helpful:

- CDFW Invasive Species Program
- Habitattitude - Adopt a conservation mentality. Protect our environment by not releasing un-wanted fish and aquatic plants
- California Invasive Species Action Week

Glossary

Alevin: A newly hatched salmon or trout with a yolk sac attached to its stomach. The alevin hide between the gravel in the streambed, sustained by the nutrition in the yolk sack.

Anadromous fish: Fish that spend the greater share of their lives in salt water but are born in and migrate back to fresh water to reproduce.

Aquarium: A tank of water in which eggs can be hatched and fish can live, if the proper conditions are maintained.

Aquatic: Growing, living in or frequenting water. There are aquatic plants and animals.

Cascade: Falling water, not impressive enough to be called a waterfall and too big to be called a riffle. Cascades mix more oxygen into the water, as it tumbles over the rocks, which makes a healthier habitat for trout.

Catadromous fish: Fish species that begin their life in the ocean, then live most of their lives in fresh water, returning to the ocean to spawn. The opposite of anadromous. One example is eels.

Catch limit: The number of fish that a person can legally catch in one day. This is to protect species from becoming depleted or endangered. The limit it determined by biologists in the California Department of Fish & Wildlife.

Cobbles: Stream rocks that are 2-10 inches in diameter, the smallest almost the size of a tennis ball and the largest just bigger than a softball. Your aquarium probably has cobbles on top of the gravel.

Confluence: The place where two streams come together. Trout, salmon and steelhead often rest at these water intersections, as the water is usually fresher and colder than that in the main stream.

Dissolved oxygen: Molecules of oxygen gas that are dissolved in water. Trout need water high in oxygen to remain healthy. They can filter out 95% of the oxygen as water passes over their gills, which is way more efficient than our lungs.

Ecology: The study of the relation of organisms to and interactions of organisms with their environment. Every organism, whether plant or animal, needs a healthy environment to live in. We need a healthy environment too.

Erosion: The process by which water, wind and temperature break down rock and soil into small loose particles that can be swept away by rain or streams. Too much erosion can harm trout streams by covering redds and smothering the eggs.

Estuary: The area where the river meets the ocean and its fresh water mixes with the salt water of the sea. Most species of fish depend on healthy estuaries for food and cover when young.

Eyed eggs: Eyes are one of the first features that are visible in eggs. The eyes show as big dark spots in the egg. Eggs lacking these eyes have not been fertilized and will not hatch.

Fish ladder: A series of ascending pools of water constructed to enable salmon or steelhead to swim upstream around a dam. The fish leap from one pool to the next until they can get over the dam and swim to the spawning area.

Food chain: The transfer of food energy from the source in plants through a series of animals. The base of almost all food chains is plants. These are eaten by herbivores, which are in turn eaten by carnivores. The energy created by photosynthesis in plants is thus transferred up the food chain to sustain many other species of animals.

Fry: Small young fish that have recently hatched and have "buttoned up." Buttoning up is what happens when alevin run out of nutrition in their yolk sac and have to come out of the gravel to catch food. At this point, they no longer look like they have potbellies.

Gills: Organs on both sides of a fish's head that take oxygen from the water as it passes over them. Trout have gills instead of lungs.

Gravel: Very small rocks that are between 1/10 – 2 inches in diameter. They are larger than cobbles and smaller than boulders, and form gravel bars along creek banks where aquatic plants can grow.

Hatchery: A place where fish are spawned and eggs are hatched. The fry are raised until they are at least 7 inches long, and then released into streams and lakes. Hatcheries are an attempt to make up for the destruction of trout and salmon streams by dams. Most trout hatcheries are operated by the California Department of Fish & Wildlife.

Habitat: The place where an organism lives. Healthy habitats provide enough food, water, shelter and space to support a variety of plant and animal life.

Imprinting: The scent memory of a salmon or trout's birth stream that enable the fish to return to the same stream after 2-3 years in the ocean. The fish memorize the scent of their stream as they swim backwards on their migration toward the sea from their place of birth.

Glossary - continued

Incubate: Keeping eggs at the optimum temperature and supplied with enough oxygen so they will hatch and grow. Keeping your aquarium at the optimum temperature is essential for a successful hatch.

Lateral lines: A special line of cells on each side of a fish's body that help it sense motion and magnetic fields. The lateral lines in small fish tell it when something is coming its way, even before the fish sees it.

License: This is a permit issued by the Department of Fish & Wildlife that allows someone to hunt or fish. Fees for these permits help protect important habitat and pay the salaries of the people who determine how many of each species can be taken. Hunting or fishing without a license is a crime. The 772 permit, that goes everywhere with your eggs and fry, is also a license. It allows you to hatch the eggs of wild native animals in your classroom.

Life cycle: The stages of an organism's life. For trout and salmon, this would begin with an egg, and then develop into an alevin, then a fry, then an adult which will lay eggs to begin the process all over again.

Migration: Moving from one place to another, usually far away. Salmon and steelhead move out to sea and then back to the river where they were born. Lake trout don't migrate.

Mucous: A slippery liquid that covers the body of a trout or salmon, helping protect it from disease.
Parr marks: Curved marks on the sides of fish fry that help these fish hide from predators by making them look more like their surroundings.

Plunge pools: deep pools in streams that are made when water falls over a rock or log and scours out a hole. These holes have colder water and are a favorite habitat for trout.

Pollution: Harmful substances that can contaminate soil, water or atmosphere. Trout are very sensitive to pollution. So are many of the aquatic insect larva they eat.

Predator: An animal that eats other animals. Trout and salmon are examples. So are the animals like bears, raccoons, osprey and eagles that eat trout and salmon.

Redd: The "nest" made in the gravel of a streambed by a female trout or salmon. She then lays her eggs in the nest and covers them back up with the gravel to protect them while they are hatching. And she does all of this nest building with her tail.

Riffle: A place in a stream where the water flows quickly over rocks. These areas help aerate the water, but are shallow and expose small fish to predation.

Run: When a group of salmon or steelhead return to their birth river to spawn, they do it at the same time and this is called a run. It's a coordinated migration that takes place at a specific time of the year.

Scales: Small, overlapping, fingernail-like skin of fish. This tough skin helps control the amount of water that can leak into and out of a fish, and doesn't wrinkle like our skin would if we spent our life underwater.

School: A group of fish studying together Monday through Friday. It can also mean a group of fish that swim together for protection.

Sediment: Very fine particles of rock and soil that wash into streams. Too much sediment can clog up gravel beds and smother the eggs. Sediment comes from erosion caused by logging, roads, grazing and landslides.

Silt: Even finer particles of eroded topsoil than sediment, that cause the same problems.

Smolt: A salmon or steelhead that has outgrown its parr marks and whose body is transforming from a freshwater to a saltwater- adapted organism. This takes place in an estuary where fresh and salt water mix.

Spawn: When a female fish lays eggs and a male fish fertilizes them as they float down into the redd. Steelhead can swim back and forth from the ocean several times during their lifetime to spawn, but salmon just do it once and then die. Their bodies are eaten by aquatic insects, mollusks and crustaceans, which are then eaten by the baby fish when they hatch.

Yolk sac: The pouch of food that is connected to the stomach of fish that have just hatched. This food pouch allows the fish to hide in the gravel until they are larger and ready to catch their own food.